Wisconsin
Department of Commerce

Evaluation # 200275-M (Replaces 970014-M)

Safety & Buildings Division
201 West Washington Avenue
P.O. Box 2658
Madison, WI 53701-2658

# Wisconsin
# Building Products Evaluation

| | |
|---|---|
| Material | Pre-Engineered Modular Frame Metal Building Systems (MRF II, MRDS, MRST, and MRSS) |
| Manufacturer | Butler Manufacturing Company<br>1020 South Henderson Street<br>Galesburg, Illinois 61401 |

**SCOPE OF EVALUATION**

**GENERAL:** This is a review of the methodology used for structural performance calculations for a **"standard building package"** system. The review evaluates certain pre-engineered metal building systems manufactured by Butler Manufacturing Company, specifically the MRF II, MRDS, MRST and MRSS Series Systems. See **LIMITATIONS OF APPROVAL** section for a clarification note on "Standard Building Package".

**NOTE: Structural calculations shall be submitted in accordance with IBC Chapter 16 (Live, Ground Snow, Roof, Wind, and Seismic Loads) for ALL building submittals.**

This review includes the cited **International Building Code (IBC)** requirements below in accordance with the current **Wisconsin Amended IBC Code:**

- **Structural:** The MRF II, MRDS, MRST and MRSS Series Systems were evaluated in accordance with **ss. IBC 1603.1, 1604.1, 1604.2, 1604.3.1, 1604.3.3, 1604.4,1604.5, 1605.1, 1606** through **1609, 2208.1 [Comm 62.2208], 2209.1, 2209.2** and **2211.5.**

  Butler's metal panel roof system performance requirements shall be in accordance with **ss. IBC 1504.1, 1504.3**, **1504.3.1**, **1504.3.2**, **1504.5** and **s. IBC 1504.6**.
- **Fire classification:** Butler's metal roof panel system is a Class A assembly in accordance with **s. IBC 1505.2**.
- **Roofing:** The Butler metal roof panels shall be installed in accordance with the requirements of **s. IBC 1507.4** through **s. IBC 1507.4.4**.

  When re-roofing with Butler's building metal roof panels, installation shall be in accordance with **s. IBC 1510.1** through **s. IBC 1510.4**. Butler's roof covering materials shall be identified in accordance with **s. IBC 1506.4**.

**DESCRIPTION AND USE**

**General**: The Butler MRF II, MRDS, MRST and MRSS Series Systems pre-engineered metal building systems primary structural system consist of rigid frames as clear span or with interior columns as a modular rigid frame. The end frames consist of "C" section simple beams and posts or an H-Section modular rigid frame. Purlins and eave struts spanning between the frames support the roof panels. The wall panels span from the base to the eave and may be supported at the intermediate points by girts spanning between the frames.

**LIST OF APPROVED BUILDINGS:**

Modular frame, double slope, straight columns, **MRDS** structures:

| Building Width | Eave Height | Bay Spacing | Column Spacing | Roof Slope |
|---|---|---|---|---|
| 80' - 300' | 10' - 30' | up to 30' | 40' - 60' | 1/4:12 - 1:12 |
| 80' - 300' | 10' - 30' | up to 25' | 40' - 60' | 1/4:12 - 1:12 |

Modular frame, double slope, straight columns, **MRDS** structures:

| Building Width | Eave Height | Bay Spacing | Column Spacing | Roof Slope |
|---|---|---|---|---|
| 80' - 300' | 10' - 30' | up to 30' | 40' - 60' | 1/4:12 - 1:12 |
| 80' - 300' | 10' - 30' | up to 25' | 40' - 60' | 1/4:12 - 1:12 |

Modular frame, single slope, tapered columns, **MRST** structures:

| Building Width | Eave Height | Bay Spacing | Column Spacing | Roof Slope |
|---|---|---|---|---|
| 80' - 200' | 10' - 30' | up to 30' | 40' - 60' | 1/4:12 - 1:12 |
| 80' - 200' | 10' - 30' | up to 25' | 40' - 60' | 1/4:12 - 1:12 |

Modular frame, single slope, straight columns, **MRSS** structures:

| Building Width | Eave Height | Bay Spacing | Column Spacing | Roof Slope |
|---|---|---|---|---|
| 80' - 200' | 10' - 30' | up to 30' | 40' - 60' | 1/4:12 - 1:12 |
| 80' - 200' | 10' - 30' | up to 25' | 40' - 60' | 1/4:12 - 1:12 |

**PRIMARY STRUCTURAL MEMBERS:**

**Rigid Frames:** The rigid frames consist of tapered or straight welded-up plate sections, exterior columns and roof beams with bolted splices. For modular frames, interior columns are straight sections. The minimum yield strength of the steel used for flanges and webs is 55 ksi.

**End Frames:** H-Section roof beams and H-, or C-Section posts designed as a modular rigid frame. The minimum yield strength of the steel used for flanges and webs is 55 ksi.

The design and assembly of structural joints and connections (primary and secondary steel) using high strength steel bolts conform to the "specification for structural joints using ASTM A325 and A307 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

**SECONDARY STRUCTURAL MEMBERS**:

**End Frames:** Light gage "C" section member endwall posts and H-Section endwall roof beams. The members are fabricated from a mix of 55 ksi and 60 ksi minimum yield steel.

The purlins, girts and eave struts are cold-formed from 60 ksi minimum yield steel. The purlins and girts are Z-shaped members 9-1/2 inches deep, and the eave struts are C-shaped members 11 inches deep.

**BRACING:** Standard wind bracing is provided by using brace rod, alternate wall bracing is provided using portal frames, wind posts, or panel diaphragms.

Brace rods are designed as tension members in accordance with the applicable provisions of AISC. Rods 0.75-inch in diameter and less will have a minimum 80 ksi ultimate tensile strength. Rods larger than 0.75-inch in diameter will have a minimum 70 ksi ultimate tensile strength.

Bracing design based on panel diaphragm action will require a lineal footage of full height panels determined by eave height and wind loading.

**CLADDING:** The roof panels utilized on the MRF II, MRDS, MRST and MRSS Series Systems can either be Butlerib II or MR 24. The exterior walls are covered with Butlerib II, Stywall or Thermawall units. All steel cladding material is designed in accordance with 1996 Edition "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members" - AISI.

## TESTS AND RESULTS

Structural calculations for the "Standard Building Package" were prepared by Stuart R. Cupp, WI P.E., Galesburg, Illinois, for Butler Manufacturing Company, dated December 5, 2002 and were submitted to the department.

**Metal panel roof system performance: ss. IBC 1504.3, 1504.3.1, 1504.3.2** the MRF II, MRDS, MRST and MRSS Series Systems single slope product and the Width Extension Type II product (Butlerib II or MR 24), have been tested and certified under UL 580 testing. The panel systems have been designed for uplift using ASTM E1592 test values.

In accordance with **s. IBC 1505.1** and **1505.2** the MRF II, MRDS, MRST and MRSS Series Systems single slope product and the Width Extension Type II product (Butlerib II or MR 24), has been tested and certified as a Class A assembly under ASTM E108.

The installation of Butler's metal roof panels: **s. IBC 1507.4** through **s. IBC 1507.4.4**, meet these requirements with exceptions with respect to material.

**Note:** The minimum slope for standing seam roof systems shall be ¼:12 and the minimum slope for lapped and caulked metal roofs shall be ½:12, as stated in **s. IBC 1507.4.2**. (when applicable).

All structural mill sections or welded-up plate sections are designed in accordance with the AISC SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.

All cold-formed structural members are designed in accordance with AISI SPECIFICATION FOR THE DESIGN OF COLD- FORMED STEEL STRUCTURAL MEMBERS.

## LIMITATIONS OF APPROVAL

This evaluation is for a **"Standard Building Package** the MRF II, MRDS, MRST and MRSS Series Systems. Sample calculations are on file with the department (an approval of the methodology used for structural performance calculations). **The metal building will be constructed in accordance with the submitted calculations that shall be submitted on a job-to-job-basis.**

**Clarification Note: "Standard Building Package"** is the submitted calculation package reviewed as part of the building product approval process that **uses an assumed set of loading conditions** for the state of Wisconsin. This does not relieve the designer from submitting calculations for each project, even when the "standard building package" is what will be constructed. **Whether the "standard building package" design and construction details are modified or not, based on different loading conditions at a site, calculations shall be submitted on a job-to-job basis**.

The **"Standard Building Package" does not have** mezzanines, cranes or rooftop units, and drift or unbalanced loads from existing buildings.

**INFORMATION REQUIRED ON COMPONENT PLANS SUBMITTED FOR APPROVAL**

The approval number, member properties, sizes of all members, layout and other general requirements of **s. Comm 61.30** must be indicated on each plan submittal. **Note: Member sizes may be shown in the building plan submittal or subsequent structural component plan submittal.**

The component plans/calculations shall also list the loading conditions, exposure coefficients, and importance factors for the building plan reviewer verification.

Foundation plans shall be submitted with the building plans. The plans shall show details of footings, anchor bolt sizes, hairpin and side thrust restraint information.

The location and size and critical dimensions of all primary structural members (rigid frames, columns, beams, end walls, etc.) must be shown on the plans, this will include web and flange sizes at the base, haunch, ridge and any other location where member sizes change.

The size and spacing of secondary structural members (girt and purlin, eave strut, etc.) shall be shown on cross-sections, roof plans and framing elevations.

The size and location of all diagonal bracing must be shown on structural plans and elevations.

This approval will be valid through December 31, 2007, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

**DISCLAIMER**

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date:
Approval Date: April 18, 2003 By: _____

Lee E. Finley, Jr.
Product & Material Review
Integrated Services Bureau

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